

# LOOP POWERED DIGITAL METER

(explosion-proof; outdoor enclosure; process meter)

MODEL **43AL1-B**

## BEFORE USE ....

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.

If you have any problems or questions with the product, please contact our sales office or representatives.

### ■ PACKAGE INCLUDES:

Digital meter in an outdoor enclosure .....	(1)
Engineering unit label .....	(1) sheet
Mounting screws	
Bolt (M8 × 15).....	(4)
Spring washer for M8 .....	(4)
Mounting bracket assembly (optional)	
Mounting bracket.....	(1)
M10 U-bolt.....	(2)
Nut for M10.....	(4)
Spring washer for M10 .....	(4)
Cable glands (for flameproof option only).....	(2)
Stopping plug (for flameproof option only) .....	(1)

### ■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

### ■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

When using this product in potentially explosive atmosphere or hazardous (classified) location, you have to follow the safety procedure to install it. Please refer to "SAFE INSTALLATION MANUAL" for each type of certification.

For detailed explanations of the digital panel meter, please refer to the Model 43AL1 Operating Manual (EM-9425-B). The manual is downloadable at our web site.

## POINTS OF CAUTION

### ■ CONFORMITY WITH EU DIRECTIVES

- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the EU requirements in regard to the whole system and employ additional protective measures to ensure the EU conformity.

### ■ GENERAL PRECAUTIONS

- Before you remove the unit or mount it, turn off input signal for safety.

### ■ ENVIRONMENT

- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental (non-hazardous location) temperature must be within -40 to +70°C (-40 to +158°F) in order to ensure adequate life span and operation.
- Seal unused wiring conduits.

### ■ WIRING

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind the unit's cables together with cables where high noise levels are present. Do not install them in the same duct.
- When the unit is used in an environment where inductive noise interference is expected, ground the earthing terminal.

### ■ EX-FACTORY SETTING (/SET)

- Activating "initialization," Ex-factory settings or user's specified parameters will be deleted and overwritten with the factory default values. Notice that after this, Ex-factory settings will be irrecoverable.

### ■ AND ....

- The unit is designed to function as soon as input signal is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

## COMPONENT IDENTIFICATION

### OVERVIEW

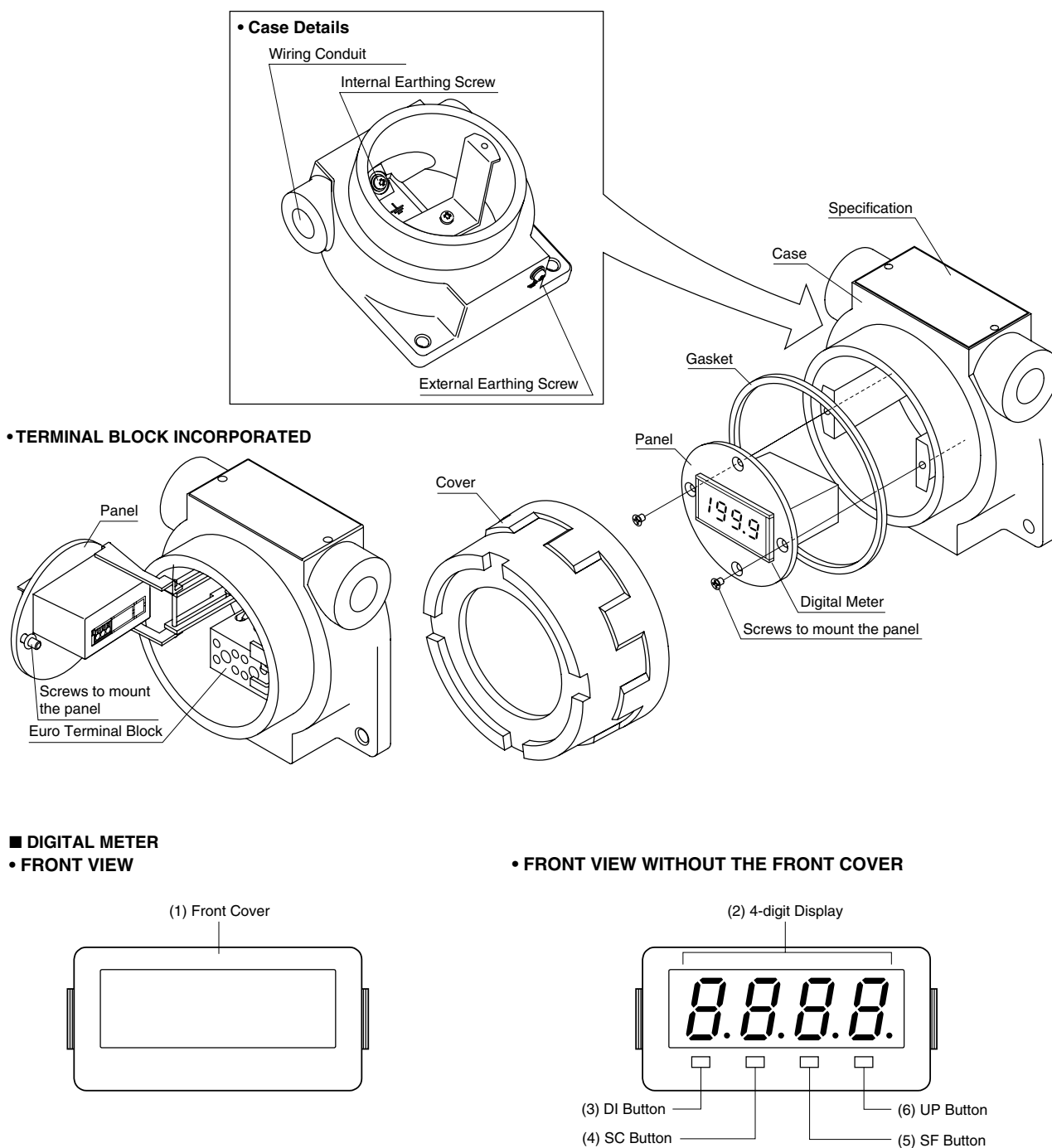


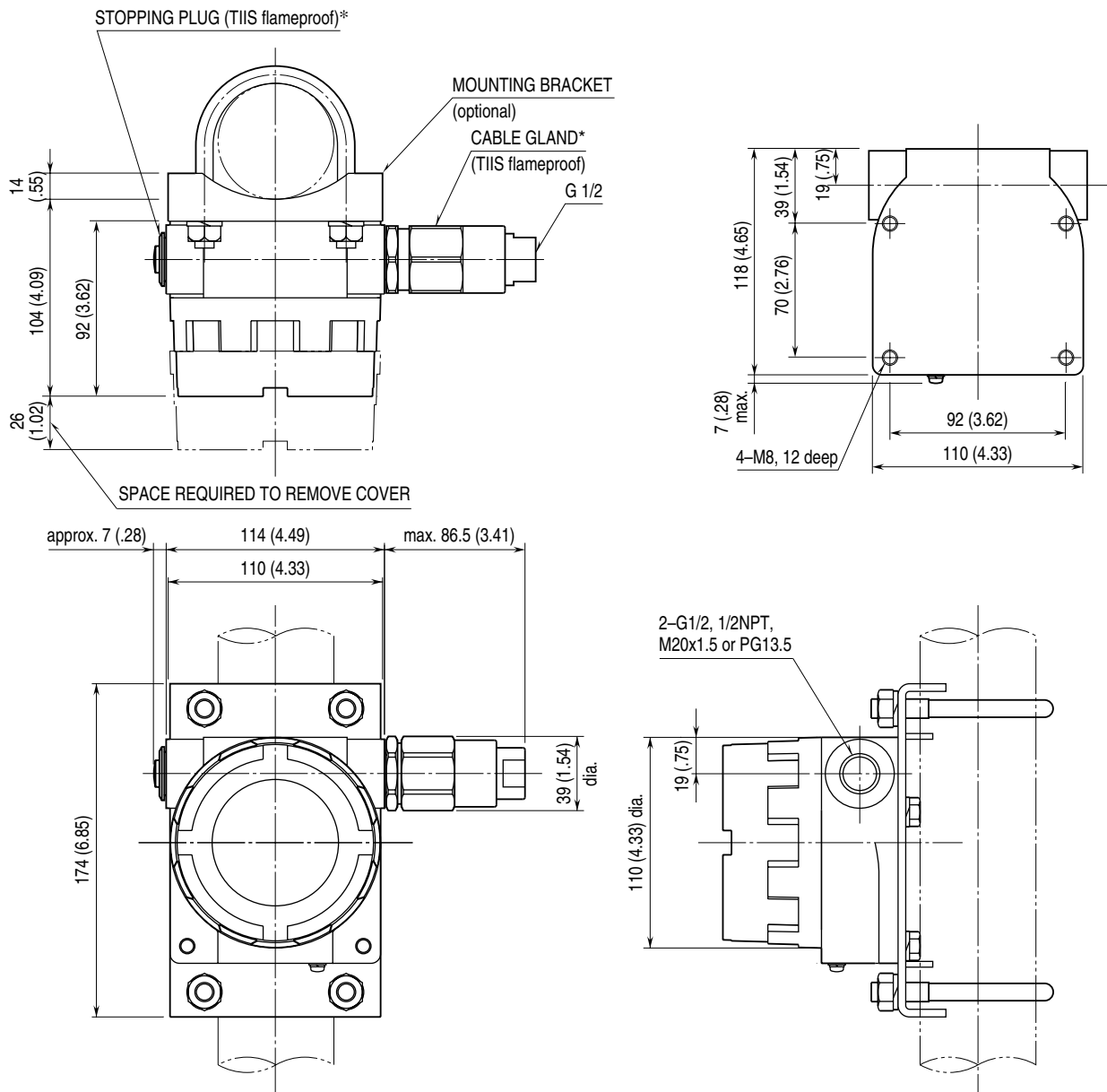
Figure 1. 43AL1-B exploded view and component identification

### COMPONENT IDENTIFICATION

No.	COMPONENT	FUNCTION
(1)	Front Cover	Removed at configuration.
(2)	4-digit Display	4-digit LED display. Range: -1999 to 9999 (not including decimal point)
(3)	DI Button	Used to move on to the display setting modes; or to shift through setting items in each setting mode.
(4)	SC Button	Used to move on to the scaling setting modes; or to shift through setting items in each setting mode.
(5)	SF Button	Used to move on to the setting standby status and shift through display digits in each setting item.
(6)	UP Button	Used to select setting value.

**EXTERNAL DIMENSIONS** unit: mm (inch)

Figure 2. 43AL1-B external dimensions

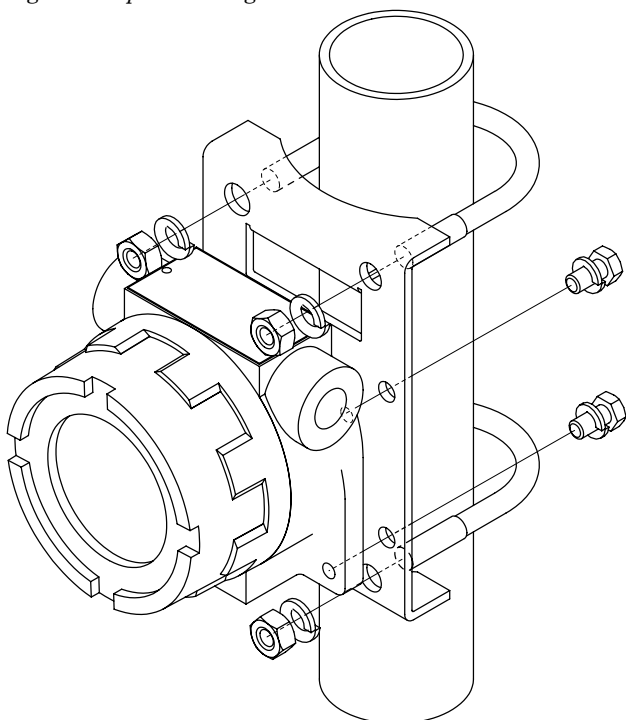


\*Two cable glands and one plug are provided with TIIS flameproof type. Use them according to the field wiring requirements.

## INSTALLATION

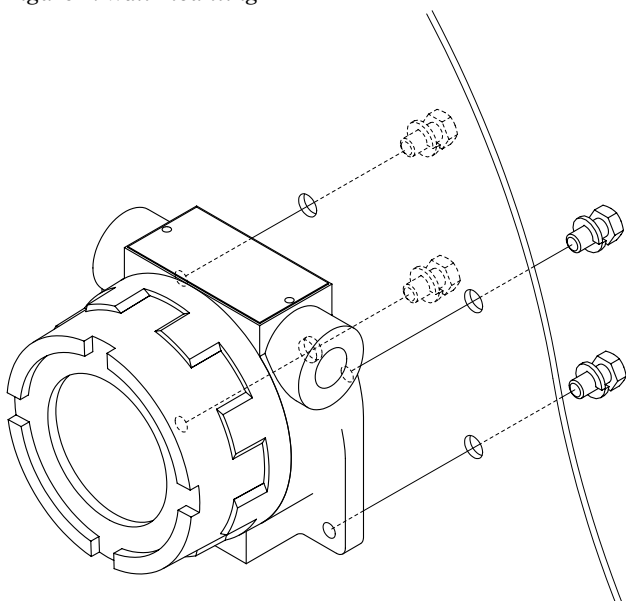
### ■ MOUNTING THE ENCLOSURE ON A PIPE

Figure 3. Pipe mounting



### ■ MOUNTING THE ENCLOSURE ON A WALL

Figure 4. Wall mounting



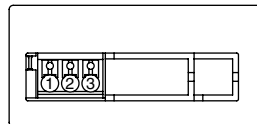
Torque for cable gland: 7.5 N·m  
 Torque for stopping plug: 3.6 N·m  
 Torque for mounting screws: 6.2 N·m  
 Torque for 2-inch pipe mounting bracket: 12.2 N·m

## TERMINAL CONNECTION

△ For use in a hazardous (classified) location, please refer to "SAFE INSTALLATION MANUAL" provided separately.

### ■ WITHOUT TERMINAL BLOCK (Connection to the rear of meter module)

#### • Terminal Assignments

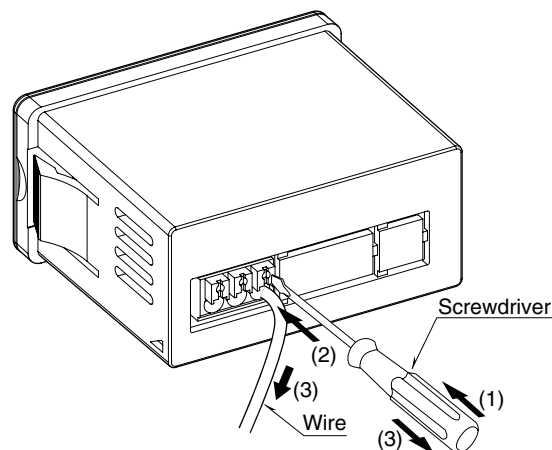


TERM.	ID	FUNCTION
1	+	Input +
2	FE	Earthing
3	-	Input -

#### • Wiring Procedure

Take the panel attaching the digital meter out of the enclosure and wire directly to the digital meter's terminals. Connecting points on the rear terminal block are located inside the digital meter housing. Please fix a wire in the following way.

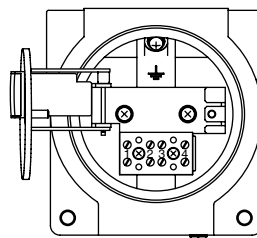
- 1) Touch flat-blade screwdriver into the groove, and then press.
- 2) Insert a wire until touching in the back.
- 3) Remove flat-blade screwdriver, please make sure that it will not come out by pulling a wire. (torque: 0.8 N·m)



Applicable wire size: 1.0 to 1.3 mm<sup>2</sup>  
 Recommended stripped length: 8 mm

### ■ TERMINAL BLOCK INCORPORATED

#### • Terminal Assignments



TERM.	ID	FUNCTION
2	HI	Input +
3	LO	Input -
1 & 4		Relaying (Shortcircuited across 1 and 4)

#### • Wiring Procedure

Loosen the screws attaching the panel to the enclosure and take it out without separating the meter and wire to the terminal block. Put the panel back inside the enclosure and tighten the screws. (torque: 0.8 N·m)

Applicable wire size: 0.2 to 4 mm<sup>2</sup>  
 Recommended stripped length: 8 mm

## ■ CONNECTION EXAMPLE

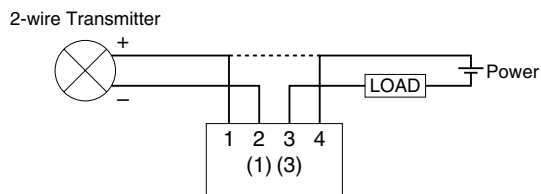
(Broken lines and terminal No. in parentheses indicate connections without terminal block.)

Voltage drop of the unit is approx. of 3.7V at 20mA input.  
Consider total circuit impedance when wiring.

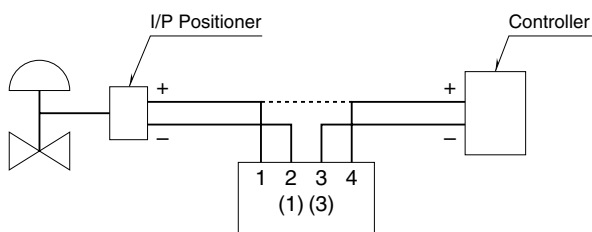
When the unit is used in an environment where inductive noise interference is expected, ground the earthing terminal.

Note: In order to improve EMC performance, bond the FE terminal to ground.

### • 2-wire Transmitter Output

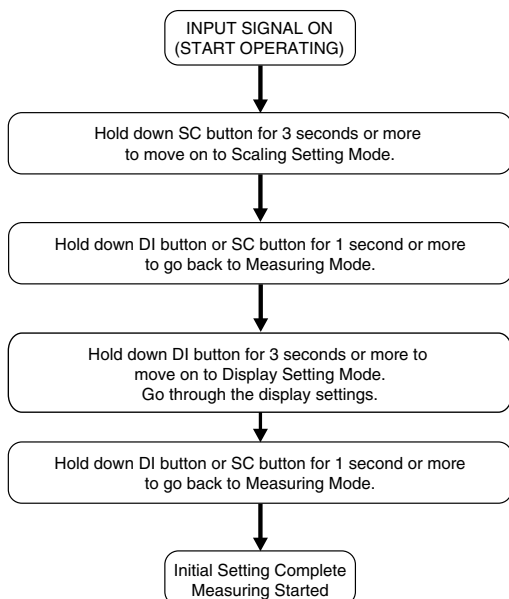


### • Valve Position Setpoint

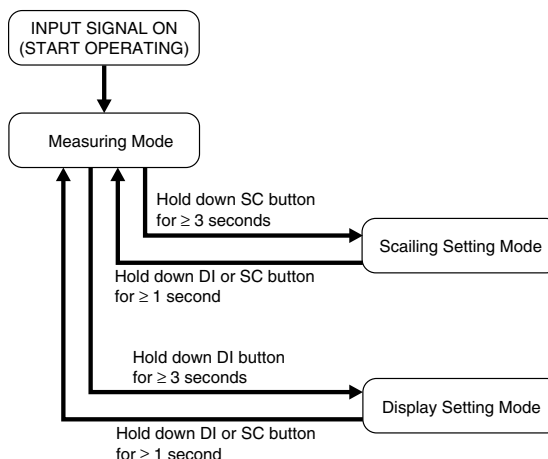


## SETTING PROCEDURE

### ■ INITIAL SETTING FLOWCHART



### ■ GENERAL SETTING FLOWCHART



Note: For 4 to 20mA DC Current meter, the initial setting is not necessary.

### ■ OPERATIONS IN SETTING MODES

#### • Display

4 digits numeric display (referred hereafter as 'display') shows the current settings while the panel meter is in the setting mode.

#### • Shifting through setting parameters

In any setting mode, pressing DI button shifts one parameter to the next. Pressing SC button shifts one to the previous.

#### • Changing parameters

Pressing SF button while one of the parameter settings is indicated on the display shifts the panel meter into the setting standby mode. The digit to which you can apply changes starts blinking.

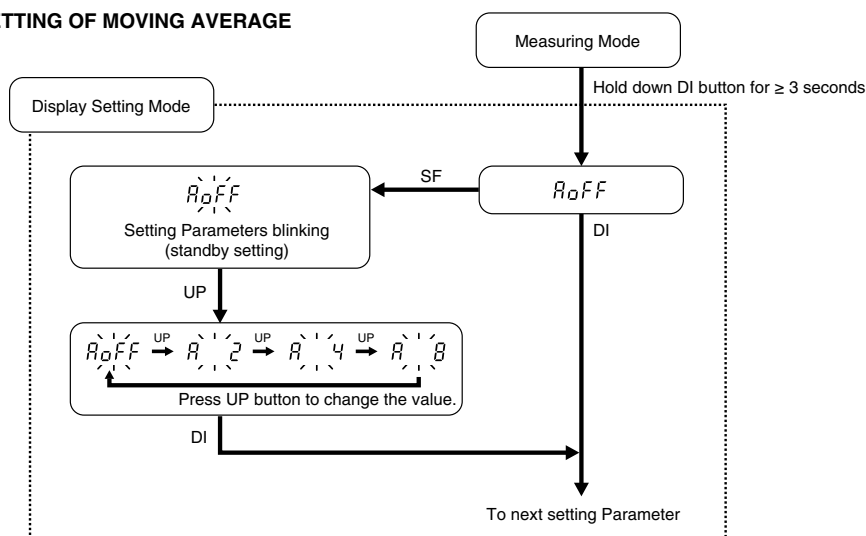
Press UP button to change the blinking value.

Press SF button to go to the next digit.

Press DI or SC button to apply the new value and go to the next parameter setting.

If no operation continues more than one minute, while changing parameter is blinking setting is registered and it turns on, otherwise it returns to measuring mode.

### ■ EXAMPLE OF SETTING OF MOVING AVERAGE

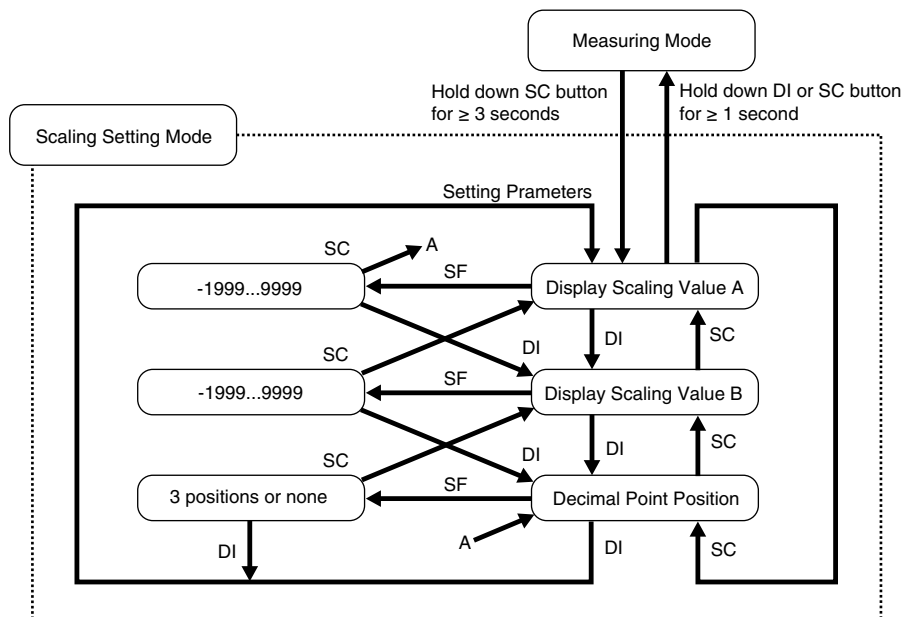


Note: For Scaling setting mode the method for using the SF and UP button is the same as for changing the Setting Parameters.

#### • If you get lost...

Hold down SF button for 3 seconds or more to return to the measuring mode without applying the last changes. (Those which have been already applied by pressing DI or SC button are not cancelled.)

■ SCALING SETTING MODE

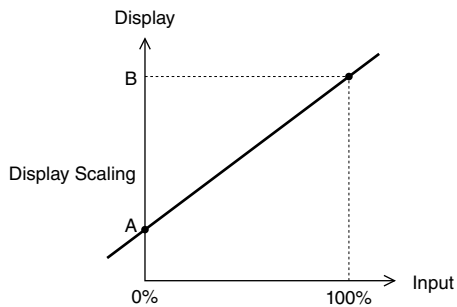


• PARAMETER LIST

PARAMETER	DISPLAY	FUNCTION	DEFAULT VALUE
Display Scaling Value A	<del>1</del> 999 ... 9999	Display value for 4 mA input To distinguish from B, the first decimal point is blinking.	04.00
Display Scaling Value B	<del>1</del> 999 ... 9999	Display value for 20 mA input	20.00
Decimal Point Position	10 <sup>-1</sup> through 10 <sup>-3</sup> or none	Decimal point position	88.88

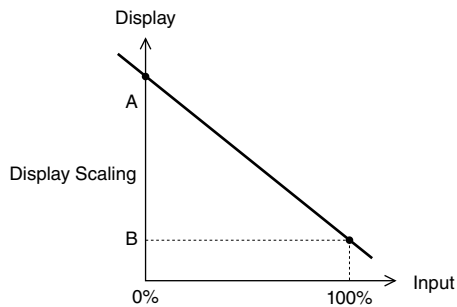
• Normal Scaling

The display value increases when the input signal increases.



• Inverted Scaling

The display value decreases when the input signal increases.



The decimal point position can be set to any digit. Set it according to the 100% value.

### • Scaling settings

Set scaling the range between -1999 to 9999 for 4 to 20 mA DC. Display scaling value has two types, A and B. Decimal point can be set at any place.

- Display scaling A is the display value for 4 mA.
- Display scaling B is the display value for 20 mA.
- Set display scaling decimal point commonly for the display scaling value A and B.

Example) For display value 0.0 to 100.0% at input 4 to 20 mA DC.

Measurement range 0 %:	4 mA DC
Measurement range 100 %:	20 mA DC
Display scaling value A:	0.0%
Display scaling value B:	100.0%
Display scaling decimal point:	888.8 (one place of decimal)

In case other than 4 to 20 mA DC (e.g. used in 6 to 20 mA DC), obtain the value when intended display value for the input signal is extended to 4 to 20 mA. Set the obtained value as the display scaling value A and B. In next paragraph, how to calculate the display scaling value A and B when used in other than 4 to 20 mA DC is explained.

### ■ SCALING EXAMPLES

#### • Example :

Input: 6 – 16 mA

Desired display value: -5.00 – +5.00

Measurement range: 4 – 20 mA

- 1) Calculate “Display Scaling Value A” with following formula.

$$\begin{aligned}
 SA &= (Rz \times Dspan + Dz \times Is - Ds \times Iz) / Ispan \\
 &= [4 \times (500 + 500) - 500 \times 16 - 500 \times 6] / (16 - 6) \\
 &= -700
 \end{aligned}$$

In the above formula, decimal points are omitted as following.

$$-5.00 - +5.00 \rightarrow -500 - +500$$

From the above calculation, the Display Scaling Value A is “-700.”

- 2) Calculate “Display Scaling Value B” with following formula.

$$\begin{aligned}
 SB &= (Rs \times Dspan + Dz \times Is - Ds \times Iz) / Ispan \\
 &= [20 \times (500 + 500) - 500 \times 16 - 500 \times 6] / (16 - 6) \\
 &= 900
 \end{aligned}$$

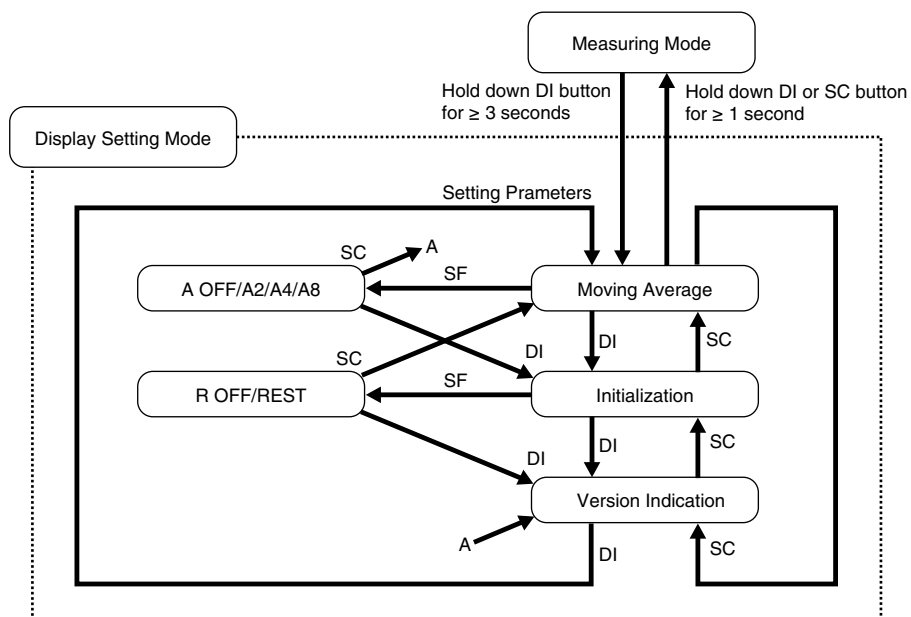
From the above calculation, the Display Scaling Value B is “900.”

- 3) Set scaling with the above parameters.

According to the display value, -5.00 – +5.00, set decimal point at the third position from LSD.



## ■ DISPLAY SETTING MODE



### • PARAMETER LIST

PARAMETER	DISPLAY	FUNCTION	DEFAULT VALUE
Moving Average	<i>R OFF</i>	No moving averaging	<i>R OFF</i>
	<i>R 2</i>	Moving average with 2 samples	
	<i>R 4</i>	Moving average with 4 samples	
	<i>R 8</i>	Moving average with 8 samples	
Initialization	<i>r OFF</i>	Non-initialization	<i>r OFF</i>
	<i>r SET</i>	Initialize settings (change to factory settings) *1	
Version Indication	-	Version number, indication only	-

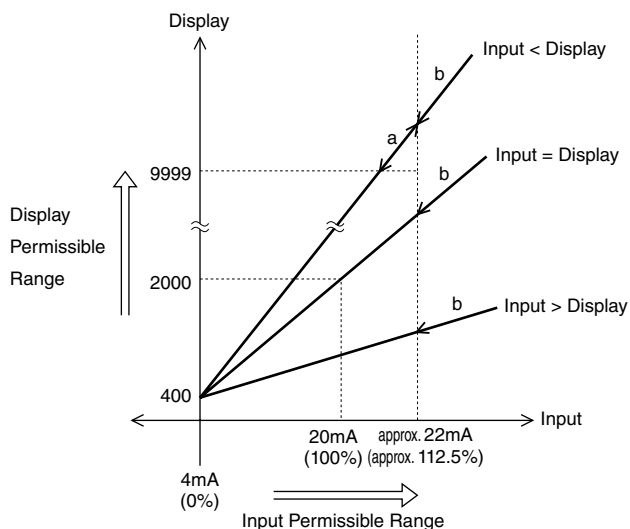
\*1. While "*r SET*" is shown, pressing **DI** button or **SC** button initializes settings.

If "Initialization" is done once, all current parameters will be deleted and overwritten with factory default values. Notice that after this, Ex-factory settings with "SET" option will be irrecoverable.

## ERROR MESSAGES

DISPLAY	ERROR MESSAGE	WHAT TO DO
S.ERR blinking	The input signal is out of the permissible range.	Set the input signal within the permissible range.
-9999 or 9999 blinking	The value after scaling is out of the permissible display range.	Set the input signal within the permissible range.

### INPUT AND ERROR CORRELATION



a: 9999 blinking

If the value to display after scaling is out of the permissible range, the maximum (9999) or minimum (-1999) value is blinking.

b: S.ERR blinking

If the input signal is out of the permissible range, the indicator will blink "S.ERR".

## CHARACTER SET

0	1	2	3	4	5	6	7	8	9	-	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
0	1	2	3	4	5	6	7	8	9	-	A	b	C	d	E	F	G	H	,	J	K	L	ñ	o	P	q	r	S	t	U	v	y	ü	ý	z	

## LIGHTNING SURGE PROTECTION

We offer a series of lightning surge protectors for protection against induced lightning surges. Please contact us to choose appropriate models.